

Correspondence

Consequences of ABM Deployment

SIR.—C. M. Herzfeld has recently analysed some operational characteristics of anti-ballistic missile (ABM) systems and, from a comparison of “thin” area defence systems and “thick” city defence systems, he concludes that, although both systems have certain advantages, “thin” systems have more than do “thick” systems (*Nature*, 219, 1315; 1968). He then proceeds to justify the US decision to deploy a “thin” ABM system (called Sentinel) because of its effectiveness against “a medium-sized unsophisticated attack” by “first or second generation inter-continental ballistic missiles (ICBM’s) from the Chinese Peoples Republic”. He claims that it is unlikely that Sentinel will be made obsolete, by any less sophisticated nation, so Sentinel “serves to produce perhaps a mild measure of stability for at least a few years in the otherwise rapidly evolving strategic situation”. Herzfeld also claims that Sentinel would “render small token attacks made for bargaining purposes, ineffective and not credible”. He admits, however, that he does not consider “the arguments from grand policy for deployment of the Sentinel system”. I suggest that the disadvantages of ABM systems completely outweigh the sort of advantages that Herzfeld lists.

Strategic balance between the superpowers. The implications of the deployment of ABM systems by the superpowers must be considered in relation to the likely effect on the strategic balance which rests on the second strike assured destruction capability of each superpower. This depends on each superpower knowing that it can strike back and inflict an unacceptable degree of damage on the other superpower even after absorbing a surprise first strike. Because this strategic equilibrium is based on the certainty that an attack by the strategic forces of one side will be followed by an annihilating counter-blow from the other side, it has made possible a period of coexistence and détente between the superpowers which has allowed some progress to be made in arms control.

A consequence of mutual deterrence is that general nuclear war between the superpowers is extremely unlikely because it is clearly in the interest of both superpowers to avoid what would amount to an act of suicide. In a certain sense, therefore, nuclear weapons have become obsolete. But, although the present strategic balance is relatively stable in the short term, it is basically an unstable equilibrium which could easily be upset by the deployment of new weapons. In terms of their effect on the equilibrium of deterrence, new weapons which improve the capability of a second strike against the opponent’s cities and populations can be regarded as stabilizing, whereas those weapons which increase the effectiveness of a first strike against the opponent’s strategic forces are destabilizing. The fact that weapons which threaten populations are, in the doctrine of deterrence, less dangerous than weapons aimed at the opponent’s strategic forces is one of the major differences between nuclear strategy and conventional strategy. A second major difference is that defensive measures which protect strategic forces are stabilizing because they increase second strike capability whereas those that protect populations are destabilizing because they reduce the effectiveness of the opponent’s second strike capability. In practice, any development which has a destabilizing effect is likely to stimulate the other side to increase the number and/or the performance of his offensive weapons

in an attempt to redress the strategic balance and, therefore, such developments are likely to lead to a reinvigoration of the arms race. It is during such a period of competition for dominance that the danger of general nuclear war becomes a real danger because deterrence is largely based on psychological factors. In a period of fluidity, characterized by uncertainty about the effectiveness of strategic (or defensive) forces, decision makers are more likely to make wrong interpretations than they are during a period of stability. Furthermore, there is a significant danger that, during a period of uncertainty brought about by the development and deployment of new weapons, one side may perceive it to be to his advantage to make a first strike if he thinks that the balance is, for a short time, sufficiently weighted in his favour. Finally, in the atmosphere of fear and mistrust which accompanies conditions of uncertainty, arms control negotiations stand very little chance of success. Such negotiations are therefore urgently necessary now, not because nuclear war is likely in the short term, but because, in the absence of agreements on a freeze and cut back in nuclear weapons, the superpowers will probably arm themselves to dangerous levels from which it will be very difficult to return. During these negotiations the superpowers should refrain from the development and deployment of new weapons particularly those that are potentially destabilizing. Admittedly this analysis is oversimplified but a more detailed analysis leads to the same general conclusions.

Consequences of ABM deployment. Although the present officially announced levels of ABM deployment are unlikely seriously to affect the present strategic equilibrium between the superpowers, the practicability of ABM deployment introduces the prospect of the attainment of a dominant position in the long run. Any new introduction of a weapons system increases the importance of the military and defence departments in the decision-making process and this usually produces a second-order destabilizing factor.

There is a great uncertainty about the effectiveness of ABM’s, because of the lack of realistic operational data. This, in itself, is a destabilizing factor because this uncertainty is likely to cause each superpower to overestimate the effectiveness of the other’s ABM system and, therefore, to over-react to this deployment. Similarly, each superpower is likely to underestimate the effectiveness of his own ABM system and consequently install a heavier deployment than is necessary to produce a required defensive result. It is well known, for example, that the reaction of the United States to the light Soviet ABM deployment has been the development of multiple independently targetable re-entry vehicles (MIRV’s). The fact that each side bases its policy on conservative estimates is a strong argument against the deployment of “thin” ABM systems.

It has been suggested that if both superpowers concentrate on the development and deployment of defensive weapons (such as ABM’s) and cut back the development and deployment of offensive weapons then the strategic situation between the superpowers would change from an equilibrium based on deterrence to one based on defence. The advocates of this theory argue that such a transition would amount to a measure of disarmament and would also decrease the danger of nuclear war between the superpowers. But the typical reaction to the deployment of defensive measures is to increase the offence. The amount of mutual trust between the superpowers necessary to allow such a transition, which would involve a period of great strategic instability, is far greater than exists at the moment or is likely to exist in the foreseeable future. Moreover, if such a level of confidence actually existed, immediate disarmament measures would, in any case, be possible.

If effective ABM’s are used to decrease the vulnerability of ICBM launching sites, they can be stabilizing. Deploying the Sentinel system for this purpose, however, puts

into question the official justification for Sentinel, namely that it is orientated only against China. This follows from the fact that the relatively primitive strategic missile force of China in the early 1970's would be a credible deterrent only if it were entirely targeted against American cities rather than missile installations. As far as is known, the Soviet ABM system is designed to protect Moscow and possibly Leningrad and is not deployed around missile sites. The use of ABM's to harden missile sites would also be likely to stimulate the opponent to improve his offence and, hence, although stabilizing in one sense, would also cause some acceleration in the arms race. The most serious consequence of the American decision to deploy ABM's at ICBM sites is the threat to the success of the arms control negotiations produced by the introduction of a factor of uncertainty into the nuclear strategic balance.

Consequences of the development of new weapons. The development of new weapons, in particular MIRV's, could have even more serious long-term consequences than ABM systems. Both superpowers have recently tested ICBM's with multiple warheads. These weapons are the logical response to ABM deployment. MIRV's are potentially very destabilizing because, if their development continues, their accuracy will probably improve to a degree which will enable a superpower to destroy all or most of the other's strategic ICBM's by a first strike. Relatively invulnerable launching sites, such as submarines, would help to stabilize the strategic situation, but submarine-based missiles are an order of magnitude more expensive to maintain than land-based missiles. Another reason why MIRV's are destabilizing is that their deployment will introduce a large factor of uncertainty in that it will be extremely difficult for each superpower to calculate with any confidence the number of warheads the other has, for this number will no longer equal the number of launching sites. At the moment each superpower can estimate the balance of forces with reasonable certainty.

"Arguments from grand policy" show that the disadvantages of the deployment of ABM's, even so-called "thin systems", completely outweigh the advantages claimed by Herzfeld which, in comparison, are relatively trivial. As far as the argument about the necessity for an ABM system as a defence against China is concerned it should be noted that there is very little, if any, evidence that China has the aggressive intentions usually ascribed to her or that she will behave so irrationally as to launch a nuclear attack on the United States. It is difficult to see why the superpowers should not rely on a policy of deterrence rather than defence with respect to China, or in other words on the same policy that they adopt towards each other. The time may be politically ripe for negotiations leading to significant arms control and disarmament measures: both superpowers have urgent and serious internal problems and are under strong pressures from their populations to concentrate their energies and resources upon them; there is no reason to doubt that both powers are sincere in their stated desire for a system of arms control; there is a sufficient measure of détente between them; they seem to be prepared to accept the strategic situation which a measure of arms reduction would produce; there is at present a strategic balance between them; both superpowers wish to prevent the expansion of the nuclear club and know that the viability of the non-proliferation treaty depends on their limiting the arms race; and both wish to prevent a general nuclear war, the likelihood of which will increase during the periods of instability which will inevitably occur if the arms race continues.

Yours faithfully,

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University News

Professor A. W. Merrison, professor of experimental physics in the University of Liverpool, and director of the Daresbury Nuclear Physics Laboratory, has been appointed Vice-Chancellor of the **University of Bristol**.

Dr R. L. Wilson has been appointed the first professor of geophysics at the **University of Liverpool**.

Professor G. W. Beadle has been named the William E. Wrather distinguished service professor at the **University of Chicago**.

Dr R. A. Cowley, Atomic Energy of Canada Limited, has been appointed to an additional chair of physics at the **University of Edinburgh**.

Dr D. G. Freiman has been named Mallinckrodt professor of pathology at **Harvard University**.

Professor G. Birkhoff has been named the first George Putnam professor of pure and applied mathematics at **Harvard University**.

Professor A. Brown has been appointed to the chair of library studies at **University College, London**.

Professor Sir Brian Windeyer, Middlesex Hospital Medical School, has been elected Vice-Chancellor of the **University of London**.

The title of professor emeritus has been conferred on **Professor O. V. S. Heath**, professor of horticulture at the **University of Reading**.

Appointments

Dr J. L. Locke has been appointed assistant director of the radio and electrical engineering division of the **National Research Council of Canada**.

Announcements

The Journal of the Linnean Society—Zoology, the **Journal of the Linnean Society—Botany**, and the **Proceedings of the Linnean Society** will from January 1, 1970, be known as the **Zoological Journal of the Linnean Society**, the **Botanical Journal of the Linnean Society** and the **Biological Journal of the Linnean Society**.

The International Cell Research Organization, under the sponsorship of UNESCO and WHO, is holding an international training course on **Molecular Aspects of Antigenicity and Immunoglobulins** in Rehovot, Israel, from November 17–29. Applications should be sent to Professor M. Sela, Department of Chemical Immunology, Weizmann Institute of Science, Rehovot, Israel.

Dr J. A. Kirchner, Yale School of Medicine, has been presented with the **Newcomb Award** of the American Laryngological Association for his contribution to literature on the larynx.

The University of Wisconsin, Ohio State University Research Foundation and the **Johns Hopkins University** have been awarded subcontracts by the National Academy of Engineering to chart methods for solving the problems connected with the development of biomedical engineering. They will report their findings to the NAE's Committee on Interplay of Engineering with Biology and Medicine.

ERRATUM. In the article "Residues of Dieldrin (HEOD) on Complete Prepared Meals in Great Britain during 1967" by McGill *et al.* (221, 761; 1969), there was an error in the units of Table 1. The units should have read " $\mu\text{g/day}$ " not "p.p.m."

ERRATUM. In the note "Horse Doping—Pharmacology and the Punter" (222, 111; 1969), the quantity of heroin mentioned in the first sentence should have been "one and a half grains", not "grams".